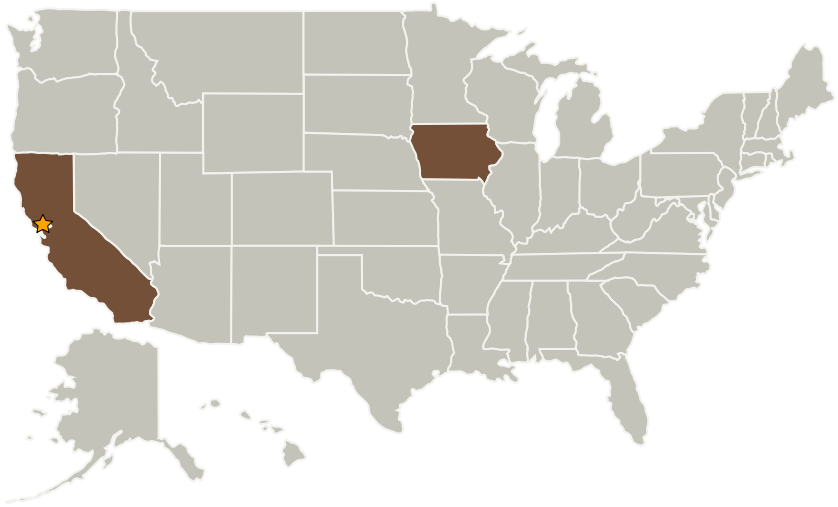
Computational Wind Tunnel: A Design Tool for Rotorcraft, Phase II

Completed Technology Project (2009 - 2011)

Project Introduction

During initial design studies, parametric variation of vehicle geometry is routine. In addition, rotorcraft engineers traditionally use the wind tunnel to evaluate and finalize designs. Estimation of rotor tunnel blockage is significantly more complex than bluff body corrections as the correction depends on operational characteristics such as rotor RPM and thrust produced. This proposal offers to develop an Integrated Design Environment (IDE) which can simulate a complete rotorcraft with or without wind tunnel walls including all the facility effects. At the heart of the innovation are: 1. An automated hybrid grid generator (viscous grids near the bodies and unstructured Cartesian grid everywhere else). 2. A robust and economical incompressible flow solver for the entire system of grids. 3. Momentum source based rotor model that is suitable and economical for simulating configurations with multiple rotors. In Phase I, the proof-of-concept developed used unstructured Cartesian grid for the model and wind tunnel. In phase II, the tool will be extended to hybrid grid with viscous grid near solid surfaces and will include several tools including a simple CAD like geometry manipulation tool and pre- and post-processing tools all integrated in one environment to facilitate ease of use.

Primary U.S. Work Locations and Key Partners



Computational Wind Tunnel: A Design Tool for Rotorcraft, Phase II

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

Computational Wind Tunnel: A Design Tool for Rotorcraft, Phase II

Completed Technology Project (2009 - 2011)

Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Sukra Helitek Inc.	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Ames, Iowa

Primary U.S. Work Locations	
California	Iowa

Project Transitions

February 2009: Project Start

February 2011: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.8 Ground and Flight Test Technologies